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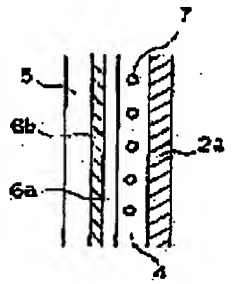
(54) PNEUMATIC TIRE FOR HEAVY LOAD

(57)Abstract:
PROBLEM TO BE SOLVED: To improve the W/B bulging or the like, and to remarkably improve the durability by, using an inner face protective layer comprising a rubber layer (A) mounted in adjacent to a carcass ply, and containing an organic acid cobalt salt, and a rubber layer (B) not containing the organic acid cobalt salt, and satisfying the specific relationship of the thickness when the thickness of the layers are respectively dA and dB.
SOLUTION: An inner face protective layer positioned on an intermediate between a carcass ply 4 which utilizes a steel code as a reinforcement material, and an inner liner 5, is formed of a rubber layer A6a and a rubber layer B6b. On this occasion, the relationship of $1/2<dB/dA<2$, more preferably $2/3 \leq dB/dA \leq 1$ should be satisfied when the thickness of the rubber layer A6a is dA, and that of the rubber layer B6b is dB, for ensuring the adhesion with the steel code, and preventing deterioration of the rubber in the inner face protective layer. By using the rubber effectively preventing the W/B bulging property (failure caused by rising of code) and suited in the deterioration resistance, as the rubber of the B layer, the weight can be reduced while keeping the prevention of bulging and the deterioration resistance on a level more than the present level.



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CLAIMS

[Claim(s)]
[Claim 1] The tread section, the side section which stands in a row with the both shoulders of this tread section, and the toe of bead of a couple, In the pneumatic tire which has the inner surface protective layer located between the carcass ply which makes reinforcing materials the steel code over a toe of bead, an inner liner, and carcass ply and an inner liner The rubber layer A which this inner surface protective layer adjoins carcass ply, and contains organic-acid cobalt salt The pneumatic tire for heavy loading characterized by having the relation of 1/2<dB/dA<2 when it consists of a bilayer of the rubber layer B which adjoins an inner liner and does not contain organic-acid cobalt salt and thickness of dA and the rubber layer B is set to dB for the thickness of the rubber layer A.
[Claim 2] The pneumatic tire for heavy loading according to claim 1 the thickness of the rubber layer A and the thickness of the rubber layer B have the relation of 2/3 <=dB/dA<=1.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the pneumatic tire for heavy loading which has in more detail the bilayer of the rubber layer which contains organic-acid cobalt salt between carcass ply and an inner liner, and the rubber layer which does not contain organic-acid cobalt salt about the pneumatic tire for heavy loading whose endurance improved.
[0002]
[Description of the Prior Art] Conventionally, the rubber constituent of the high isobutylene-isoprene-rubber system of gas opacity is used for the inner liner of the pneumatic tire for heavy loading in order to hold the pneumatic pressure of a tire, and between an inner liner and carcass ply, the squeegee rubber layer (henceforth an inner surface protective layer) with which organic-acid cobalt salt was blended is usually arranged. By the way, this inner surface protective layer plays an important role, in order to prevent the code float failure which a ply code looms in a tire inside front face, and is in sight in order for rubber to carry out a creep and to thin with transit or tire internal pressure, and the so-called VASHU bread failure (henceforth a W/B nature blister). Therefore, from this point, creep resistance is wanted to use good rubber as a property of inner surface prot ctive layer rubber. Moreover, although organic-acid cobalt salt is usually blended with the carcass ply coating rubber of the pneumatic tire for heavy loading which makes a steel code the reinforcing materials of carcass ply as a ****** arrival agent in order to raise an adhesive property with a steel code, when the coat to the steel code of coating rubber is imperfect, adhesion sufficient between a steel code and rubber will not be obtained, but serious failure will be produced in a tire activity. For this reason, generally, similar rubber is used and to make this inner surface protective layer rubber contain the organic-acid cobalt salt as an adhesion promoter is made into that ply coating rubber and combination are the same or an unescapable thing at the inner surface protective layer between an inner liner and ply coating rubber.
[0003] However, blending organic-acid cobalt salt with rubber has an adverse effect on the endurance of a tire preferably from rubber degradation. Especially, since it is located in the place near a tire inside front face through an inner liner, in itself, an inner surface protective layer is a member which is comparatively easy to receive rubber degradation, in the tire transit after rubber degradation, when its projection is overshot and a form is carried out very much, produces rubber destruction within an inner surface protective layer, and results in tire failure of a blowout etc. Therefore, as a property of inner surface protective layer rubber, degradation-proof nature is wanted to use good rubber with the aforementioned creep resistance. However, actually, the degradation-proof nature of inner surface protective layer rubber was not necessarily enough, and it was difficult in the conventional pneumatic tire inner surface protective layer for heavy loading to improve further the both sides of creep resistance and degradation-proof nature, with an adhesive property maintained. On the other hand, especially this invention person got to know that it was possible to carry out the gage down of the rubber layer of the inner liner containing organic-acid cobalt salt further in current production process capacity by improvement in the hole opening detection precision of a rubber sheet with the latest advance of the rolling related technique of tire manufacture etc.
[0004]
[Problem(s) to be Solved by the Invention] This invention aims at offering the pneumatic tire for heavy loading which raised endurance remarkably, maintaining an adhesive property with the steel code of the inner surface protective layer located between the inner liner of the pneumatic tire for heavy loading, and carcass ply, and extent of W/B nature blister prevention under such a situation more than before.
[0005]
[Means for Solving the Problem] this inv ntion person repeated research wholeheartedly that the above- 20

mentioned technical problem should be solved. Consequently, the inner surface protective layer of the pneumatic tire for heavy loading was made into the bilayer, organic-acid cobalt salt was contained only in the rubber layer which adjoins carcass ply, and in the rubber layer which adjoins an inner liner, organic-acid cobalt salt found out that the both sides of the creep resistance of an inner surface protective layer and degradation-proof nature were improvable, maintaining adhesive level by using the rubber which is not contained. Namely, the sid section of the couple with which this invention is connected with the both shoulders of the tread section and this tread section, In the pneumatic tire which has an inner surface protective layer between a toe of bead, the carcass ply which makes reinforcing materials the steel code over a toe of bead, an inner liner, and carcass ply and an inner liner The rubber layer A which this inner surface protective layer adjoins carcass ply, and contains organic-acid cobalt salt When it consists of a bilayer of the rubber layer B which adjoins an inner liner and does not contain organic-acid cobalt salt and thickness of dA and the rubber layer B is set to dB for the thickness of the rubber layer A, the pneumatic tire for heavy loading characterized by having the relation of 1/2<dB/dA<2 is offered.

[0006]

[Embodiment of the Invention] In this invention, carcass ply coating rubber and combination are rubber of the same or resemblance, and the rubber which constitutes the rubber layer A which adjoins carcass ply among inner surface protective layers contains organic-acid cobalt salt. Although organic-acid cobalt salt is blended with the carcass ply coating rubber which usually makes a steel code reinforcing materials as an adhesion promoter of adhesion of rubber and a steel code here and there is especially no limit, naphthenic-acid cobalt, stearin acid cobalt, oleic acid cobalt, toll oleic acid cobalt, resin acid cobalt, etc. are mentioned, for example. The loadings of organic-acid cobalt salt are usually the 0.1 - 2.0 weight section to the rubber 100 weight section. The rubber of the rubber layer A has desirable independent or blend rubber which usually contains 70 % of the weight or more of natural rubber, and synthetic polyisoprene rubber, polybutadiene rubber, styrene butadiene rubber, etc. are mentioned as other rubber in the case of blend rubber here.

[0007] moreover, the thing of FEF, HAF, or ISAF grade uses the carbon black blended with the rubber layer A -- having -- the loadings -- the rubber 100 weight section -- receiving -- 40 - 65 weight section -- it is 45 - 60 weight section preferably. Furthermore, the amount of sulfur blended with the rubber layer A is usually 4 - 7 weight section. Moreover, a vulcanization accelerator, an antioxidant, a softener, etc. are blended suitably. Next, the rubber layer B which adjoins the inner liner is rubber which does not contain organic-acid cobalt salt. There are few especially sulfur loadings than the loadings of the rubber layer A, and it is [sake / on a degradation-proof disposition] desirable to consider as 3 - 5 weight section to the rubber part 100 weight section. Moreover, it is desirable to make [more] the carbon BURA@KKU loadings of the rubber layer B from the point of W/B nature blister prevention than the loadings of the rubber layer A, and to consider as 50 - 65 weight section to the rubber part 100 weight section.

[0008] Next, based on a drawing, it explains further as an example of this invention. Drawing 1 is right half section drawing of the tire for heavy loading in this invention, and consists of the carcass ply 4 (only innermost layer ply is illustrated) over a toe of bead 3, the tread section 1, the side section 2, an inner liner 5, and an inner surface protective layer 6. Moreover, drawing 2 is the cross-section detail drawing of the side section 2, and the inner surface protective layer located in the medium of the carcass ply 4 and an inner liner 5 consists of rubber layers B shown by the rubber layer A shown by 6a, and 6b. Here, for the degradation-proof nature of adhesive reservation and inner surface protective layer rubber with a steel code, when thickness of dA and the rubber layer B is set to dB for the thickness of the rubber layer A, it is required the relation of 1/2<dB/dA<2 and to have satisfied the relation of 2/3 <=dB/dA<=1 still more preferably.

[0009] That is, when the rubber layer A is made thin and the value of dB/dA becomes two or more, the sheet for rubber layer A has a possibility of producing a local hole opening in a production process. Moreover, since the rate that the good rubber layer B of degradation-proof nature occupies decreases conversely when an A horizon is thick and the value of dB/dA is 1/2 or less, improvement in the rubber-proof degradation nature as the whole inner surface protective layer becomes difficult. Moreover, from Men [code / steel] of adhesive reservation, if the thickness dA of the rubber layer A is about 0.5-1.5mm, it is enough. Furthermore, in this invention, it is also possible to lightweight-ize a tire more by the gage down of the whole inner surface protective layer, maintaining an adhesive property, a W/B nature blister, and degradation-proof nature more than the present level, since the rubber which suited B horizon rubber at W/B nature blister prevention and degradation-proof nature was us d.

[0010]

[Example] Next, an example and the example of a comparison explain this invention concretely. A sample offering tire is size 11R22.5. It is the tire for truck buses of a rib pattern, and the configuration of an inner surface protective layer was indicated to the 1st table. Here, the naphthenic-acid cobalt as an adhesion promoter is

contained in the rubber layer A, and is not contained in the rubber layer B. Th following basic combination performed the rubber layer A and the rubber layer B.
Natural rubber 100 weight sections carbon black FEF 55 weight sections softener 1.0 weight section naphthenic-acid cobalt (rubber layer A) 2.0 weight s ctions zinc white 6.0 weight sections stearin acid (rubber layer B) 2.0 weight sections antioxidant 2.0 weight sections sulfur 5.0 weight sections vulcanization accelerator The 0.8 weight sections [0011] After assessment of a sample offering tire performed about 100,000km driving test, it dissected the tire and performed the adhesive property with elongation, a W/B nature blister, and a ply code with th following measuring methods about the inner surface protective layer at the time of rubber fracture.
(1) JIS**3 sample was extracted about three sorts of rubber of the compound layer of the rubber layer A as an elongation inner surface protective layer, the rubber layer B, and the rubber layers A and B at the time of rubber fracture, and it measured with the Instron tension tester. In addition, in the example 3 of a comparison, all of three sorts of above-mentioned rubber are the same rubber.
(2) W/B nature blister (VASHU bread failure)
About the tire after a driving test, only an inner liner is stripped off, inner surface protective layer rubber (equivalent to the rubber layer B except example of comparison 3) was exposed, it caved in and the concavo-convex condition was evaluated by the average of an amount (the vertical die length of concavo-convex Yamabe and a trough). It is shown that W/B nature is so bad that a numeric value is large.
(3) The innermost layer ply of the adhesive tire shoulder with a ply code was extracted, the adhesive strength between a steel code and rubber was measured at minus 80 degree C, and the rubber deposit efficiency to the steel code in that case compared. In addition, in the above, the characteristic which set the example 3 of a comparison by the conventional tire with the much more inner surface protective layer to 100 showed assessment of various trials. It is shown that any trial is so good that a numeric value is large. A result is shown in the 1st table.
[0012]
[A table 1]

第1表

		実施例1	実施例2	比較例1	比較例2	比較例3
内面保護層の構造		2層	2層	2層	2層	1層
内面保護層	ゴム層A					有機酸コバルト塩有り、ゴム層厚1.8mm
	有機酸コバルト塩	有り	有り	有り	有り	
	厚さ (mm)	0.9	1.2	0.6	1.2	
	ゴム層B					
	有機酸コバルト塩	なし	なし	なし	なし	
	厚さ (mm)	0.9	1.2	1.2	0.6	
試験結果	引破断時伸び (指数)					
	ゴム層A	110	105	105	108	100
	ゴム層B	98	99	97	100	100
	A, Bゴム層全体	105	102	100	104	100
	W/B 性ふくれ (指数)	101	102	100	99	100
	プライコードとの接着性 (指数)	100	100	100	95	100

[0013] The above-mentioned result shows the following things. The thickness as the whole inner surface protective layer of the tire of the example 1 by this invention is the same as that f th conventional tire (example 3 of a comparison). And in spite of being 1/2 of a tir conventionally as a rubber layer containing organic-acid cobalt salt The adhesive property and the W/B nature blister of the characteristic of elongati n are improving substantially with 105 in comparison with the example 3 of a comparison at the time of the rubber fracture as A in an inner surface protective layer, and the whole B horizon, with the engine performance more than before maintained. Moreover, an example 2 is the tire manufactured like the example 1 except having increased each thickn ss of the rubber layer A and the rubber layer B, and the both sides of elongation and a

W/B nature blister are improv d in comparison with the example 3 of a comparison at the time of rubber fractur , with the adhesive property held. However, elongation is inferior to the example 1 at the time of rubber fracture. In the case of an example 2, generation of heat becomes large according to the thickness buildup as the whole inner surface protective layer, and the reason is considered because rubber degradation also progressed. on the other hand -- the example 1 of a comparison, and the example 2 of a comparison -- the ratio of thickness dB of the rubber layer B, and the thickness dA of the rubber layer A -- since dB/dA has not satisfied the relational expression specified by this invention, the amelioration effectiveness is not acquired as compared with any conventional tire (example 3 of a comparison) or case, either.

[0014]

[Effect of the Invention] According to this invention, it is possible to be able to improve the both sides of a W/B natur blister related to elongation and the creep resistance of an inner surface protective layer at the time of the rubber fracture related to the degradation-proof nature of an inner surface protective layer, consequently to raise the endurance of the pneumatic tire for heavy loading remarkably about the inner surface protective layer arranged between the inner liner of the pneumatic tire for heavy loading and carcass ply, without having an adverse effect on an adhesive property with a ply code. Moreover, the amount of the expensive organic-acid cobalt salt used can be decreased substantially, without spoiling the tire engine performance by making thin the rubber layer which needs combination of organic-acid cobalt salt. Furthermore, it is also possible to lightweight-ize a tire more by the gage down of the whole inner surface protective layer.

[Translation done.]